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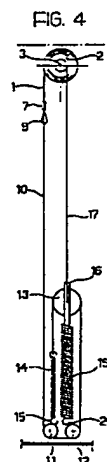
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(54) **Roller door.**

(57) A cable (10) is connected to each of the ends of the cross member (7) fixed to the free end of the flexible panel (1) of a roller door, and passes over lower fixed return pulleys (11, 12), over an upper pulley (13) which is rotatable in a vertically movable bracket (16), and is connected to a lower fixed point (15) with the interposition of a helical tensioning spring (14) working under tension. The bracket (16) is supported by a flat belt (17) or a cable wound onto the shaft (3) of the roller (2) onto which the panel (1) is wound, in the opposite sense to the sense of winding of the panel, and is subject to the action of a balancing spring (19) working under tension and serving to balance the weight of the panel. The balancing spring (19) may be replaced by a counterweight (24).



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## Description

## Roller Door

The present invention relates to a roller door including a flexible panel provided with a cross member at its free end, a roller onto which the panel is wound, two vertical guide frames provided with facing vertical slots in which the ends of the cross member are engaged, means for balancing the weight of the panel, and means for keeping the panel under tension vertically.

A roller door of the above type is known from the published European application EP-A-144,893 and includes balancing torsion springs housed in the upper horizontal roller onto which the panel is wound and tensioning torsion springs arranged at the sides of the roller, which tension the panel by means of lateral vertical cables and pulleys fixed to the ground.

Since helical torsion springs have much greater diameters than helical tension springs with the same performance, this solution requires shafts of very large dimensions and does not permit the production of large doors. Moreover, this solution involves difficulties in the carrying out of maintenance and adjustment of the springs, which are not situated in easily accessible positions.

A roller door of the above type is known from the patent US-A-3,878,879 and uses, on each of the two sides of the door, a closed system constituted by a cable which connects the free end of the panel to a roller fast with the roller onto which the panel is wound and passes over two fixed pulleys and a vertically movable pulley subject to the action of a counterweight.

This closed system simultaneously fulfils the functions of balancing the weight of the panel and of tensioning the panel itself.

This system has the disadvantage that adjustment of the balancing necessarily involves an undesirable simultaneous variation of the tensioning.

Published European patent application EP-A-125,217 describes a variant of the system known from the aforementioned patent US-A-3,878,879, in which the counterweight acting on the vertically movable pulley is replaced by a helical spring working under tension and, in the case of large doors, a second cable is added which is wound onto a roller fast with the roller onto which the panel is wound and having a larger diameter than the latter, passes over pulleys, and is subject to the action of a counterweight having the function of increasing the balancing of the weight of the panel. As well as the disadvantages indicated above, this system has a more complicated and expensive structure.

In order to avoid the problems of the aforementioned known solutions, the subject of the present invention is a roller door of the type specified above, whose main characteristic lies in the fact that to each of the ends of the cross member is connected a cable which passes over at least one lower return pulley supported rotatably at the base of the respective vertical frame and over an upper pulley mounted rotatably on a vertically movable bracket

supported by a flat belt or cable wound onto the shaft of the roller in the opposite sense to the panel, and which is connected to a fixed point at the base of the frame with the interposition of a tensioning spring working under tension and serving to keep the panel under tension, the bracket being subject to the action of balancing means which exert thereon from below a downward force serving to balance the weight of the panel.

Further characteristics and advantages of the present invention will become clear from the description which follows with reference to the appended drawings, provided purely by way of non-limiting example, in which:

Figure 1 is a partially-sectioned schematic front view of a roller door according to the invention,

Figure 2 is a schematic plan view of Figure 1,

Figure 3 is a partial section taken on the line 3-3 of Figure 1,

Figure 4 is a view similar to Figure 3 with the door in the open condition,

Figure 5 is a perspective detail of the device for adjusting the tension of the balancing spring,

Figure 6 is a variant of Figure 5,

Figures 7 and 8 show a variant of the invention in views similar to those of Figures 3 and 4,

Figures 9 and 10 are views similar to Figures 3 and 4 of a further variant, and

Figure 11 is a partially-sectioned partial side view of the part indicated by the arrow XI in Figure 9.

In the embodiment illustrated in Figures 1 to 5, the flexible panel, for example of plastics material, of a roller door is indicated 1.

The panel winds onto a winding roller 2 whose shaft 3 is supported rotatably in the upper structure of the door, indicated 4.

The shaft 3 is rotated by an electric motor M through a transmission 5.

An electromagnetic brake 6 associated with the motor M is released when the motor is supplied and engaged under the action of a spring when there is no supply to the motor.

A lever control (not illustrated) enables the above brake to be released in an emergency, to enable free rotation of the shaft 3.

The free end of the panel 1 carries a cross member 7 whose ends are engaged in guide slots formed in two vertical frames 8 which support the upper structure 4.

Associated with the cross member 7 is a rubber protective device 9 serving to reverse the sense of rotation of the motor M in the event of the cross member encountering an obstacle during the closing of the door.

Connected to each of the two ends of the cross member 7 is a cable 10 which passes, within the respective frame 8, over two lower return pulleys 11,

12 rotatably supported at the base of each vertical frame 8, and which is wound, in the sense opposite the sense of the winding of the panel 1, onto an upper vertically movable pulley 13 connected with the interposition of a helical tensioning spring 14 working under tension, to a fixed point 15 at the base of the frame.

The pulley 13 is supported rotatably by a bracket 16 supported by a belt 17 whose folded end is gripped by a clamp 18.

The belt 17 (which could also be replaced by a cable) is wound onto the shaft 3 of the roller 2 in the sense opposite the sense of winding of the panel. Clearly, instead of being wound directly onto the shaft 3, the belt 17 could be wound onto a pulley fixed to the shaft.

The bracket 16 is connected at its lower end to a helical balancing spring 19 working under tension, the lower end of which is connected to a fixed point 20 at the base of the frame 8.

The spring 19 is preferably dimensioned so as to exert on the shaft of the roller 2 a moment greater than that exerted by the weight of the panel 1 in a clockwise sense when the door is in the closed position.

The device described above enables a correct and constant balancing of the weight of the panel 1 and its cross member 7 to be achieved as a result of the variations in the diameters of winding of the panel 1 on the roller 2 and of the belt or cable 17 on the shaft 3 which occur as the door moves from the open position to the closed position. Moreover, it enables the desired tensioning of the panel to be achieved when the door is closed.

As illustrated in Figure 5, the lower end of the bracket 16 carries a cross member 20 inserted between the upper coils of the spring 19.

A possible counterweight fixed to the base of the bracket 16 and housed within the balancing spring 19 is indicated 21.

The above-described device for connection between the bracket 16 and the balancing spring 19 enables the tension of the spring to be adjusted easily from the ground. In fact, after the disengagement of the clamp 18 to detach the belt 17 from the bracket 16, it is only necessary to rotate the bracket to vary its axial position relative to the spring 19.

The tension of the tensioning spring 14 can also be adjusted easily with the use of a known axially adjustable attachment device for connecting this spring to the cable 10.

It is thus possible easily to adjust the tension of the balancing springs 19 housed in the vertical frames 8 in the event that the characteristics of these springs undergo variations with time, and to adjust the tension in the tensioning springs 14 according to the wind strength.

Furthermore, the above-described system enables extremely quick, simple and effortless manual operation in an emergency; in fact, it suffices manually to release the brake coupled to the electric motor M, since the closed door opens automatically up to its maximum height due to the prevalence of the moment exerted by the spring 19 over the moment exerted by the weight of the panel 1.

In the embodiment shown in Figure 6, the device for adjusting the tension in the balancing spring 19 differs from that described with reference to Figure 5 in that a cross member 20a provided with two holes 22 at its ends, through which the upper coil of the spring 19 is passed, is fixed to the base of the bracket 16. In this case, the adjustment of the tension of the spring 19 is also achieved by rotation of the cross member 20a relative to the spring after the removal of the clamp 18, which must be fixed again after adjustment.

The variant illustrated in Figures 7 and 8 differs from that illustrated in Figures 3 and 4 in that the cable 10 passes over a single return pulley 23 at the bottom and is wound onto the movable pulley 16 in the sense opposite the sense of winding of the panel. In this case, the tensioning spring 14 housed in each of the two vertical structures 8 is situated on the side of the panel 1 opposite the balancing spring 19, instead of being between the panel 1 and the spring 19 as in the embodiment described above.

The variant illustrated in Figures 9 to 11 differs from the embodiment of Figures 3 and 4 in that the spring 19 for balancing the weight of the panel has been replaced by a counterweight 24 fixed to the bracket, indicated 116, which is supported by the belt 17 and carries the upper return pulley 13 for the cable 10.

As shown in Figure 11, the bracket 116 is in the form of a hollow body comprising two containers 25 which are side by side and support the pulley 13 between them. The lower parts of the containers 25 contain lead which is introduced by casting and forms the counterweight 24. Loose metallic material can be added to the upper parts of the containers 25 to adjust the balancing.

## Claims

1. A roller door including a flexible panel (1) provided with a cross member (7) at its free end, a roller (2) onto which the panel is wound, two vertical guide frames (8) provided with facing vertical slots in which the ends of the cross member (7) are engaged, means (19, 24) for balancing the weight of the panel, and means (14) for keeping the panel under tension vertically, characterised in that to each of the ends of the cross member (7) is connected a cable (10) which passes over at least one lower fixed return pulley (11, 12; 23) supported rotatably at the base of the respective vertical frame (8) and over an upper pulley (13) mounted rotatably on a vertically movable bracket (16, 116) supported by a flat belt (17) or a cable wound onto the shaft (3) of the roller (2) in the opposite sense to the panel (1), and which is connected to a fixed point (15) at the base of the frame (8) with the interposition of a tensioning spring (14) working under tension and serving to keep the panel (1) under tension, the bracket (16, 116) being subject to the action

of balancing means (19, 24) which exert thereon from below a downward force serving to balance the weight of the panel (1).

2. A door according to Claim 1, characterised in that the balancing means comprise a balancing spring (19) working under tension and connecting the bracket (16) to a fixed point (20) situated at the base of the respective vertical frame (8).

3. A door according to Claim 2, characterised in that the action of the balancing spring (19) is assisted by a counterweight (21) applied to the bottom of the bracket (16).

4. A door according to Claim 2, characterised in that the balancing spring is a helical tension spring (19), and in that the bracket (16) is provided at its base with a cross member (20) inserted between the upper coils of the spring (19) so that adjustment of the tension of the spring (19) is achieved by rotation of the cross member (20) relative to the spring (19).

5. A door according to Claim 2, characterised in that the balancing spring is a helical tension spring (19), and in that the bracket (16) is provided at its base with a cross member (20a) having two end holes (22) with horizontal axes, through which the upper coil of the spring (19) passes so that adjustment of the tension of the spring (19) is achieved by rotation of the cross member (20a) relative to the spring.

6. A door according to Claim 2, characterised in that each cable (10) connected to the cross member (7) of the panel (1) passes over two lower fixed return pulleys (11, 12) and is wound onto the movable pulley (13) in the same sense of winding as the panel (1), so that the tensioning spring (14) is between the panel (1) and the balancing spring (19).

7. A door according to Claim 1, characterised in that each cable (10) connected to the cross member (7) of the panel (1) passes over a lower return pulley (23) and is wound onto the movable pulley (16) in the sense opposite the sense of winding of the panel (1), so that the tensioning spring (14) is situated on the opposite side of the panel (1) to the balancing spring (19).

8. A door according to Claim 1, characterised in that:

- the balancing means (19, 24) are dimensioned so as to exert on the shaft (3) of the roller (2) a moment greater than that exerted by the weight of the panel (1) in the various positions of the door,

- the roller (2) on which the panel (1) is wound is controlled by an electric motor (11) through an electromagnetic brake (6) and is provided with a manual control for releasing the brake and enabling the automatic opening of the door under the action of the balancing means (19, 24) in an emergency.

9. A door according to Claim 1, characterised in that the balancing means are constituted by a counterweight (24) applied to the base of the vertically movable bracket (116).

10. A door according to Claim 1, characterised in that the bracket (16) is in the form of a hollow body, and in that the counterweight (24) is constituted by lead cast into the lower part of the hollow body.

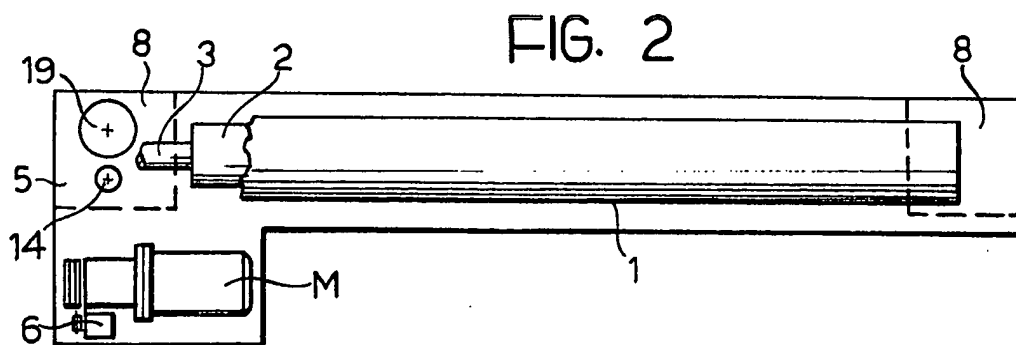
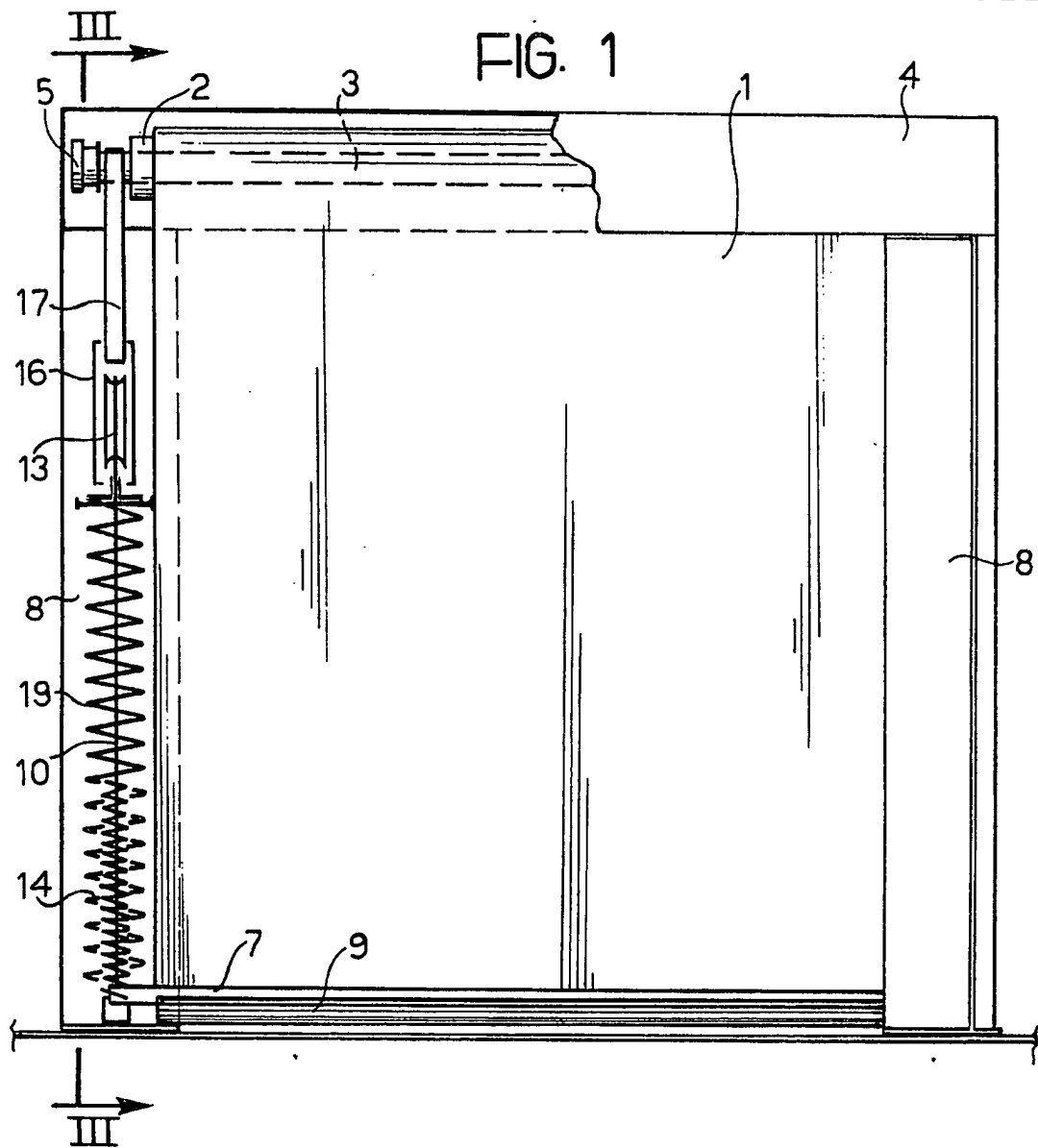


FIG. 3

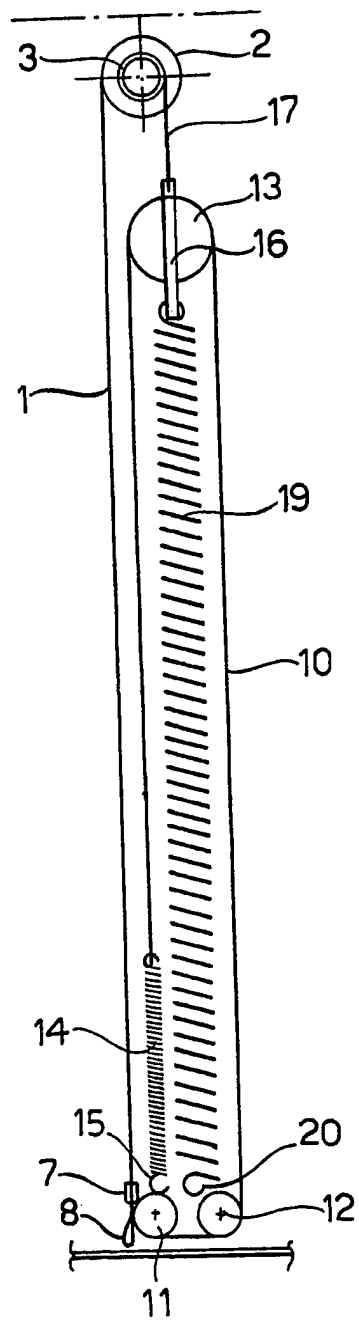


FIG. 4

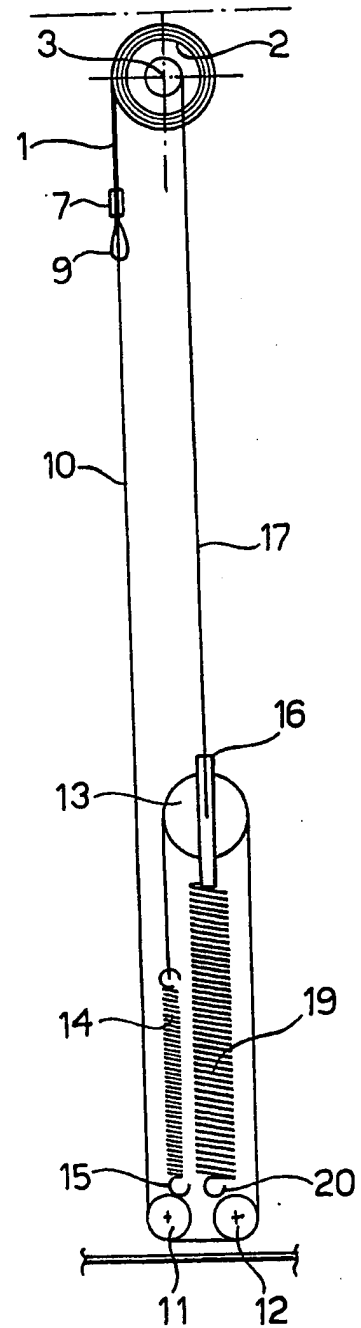


FIG. 5

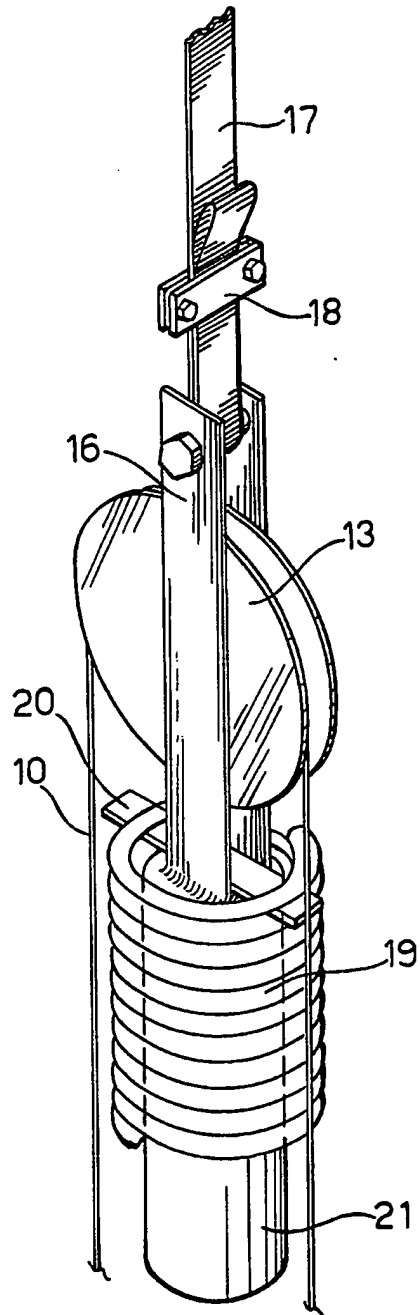


FIG. 6

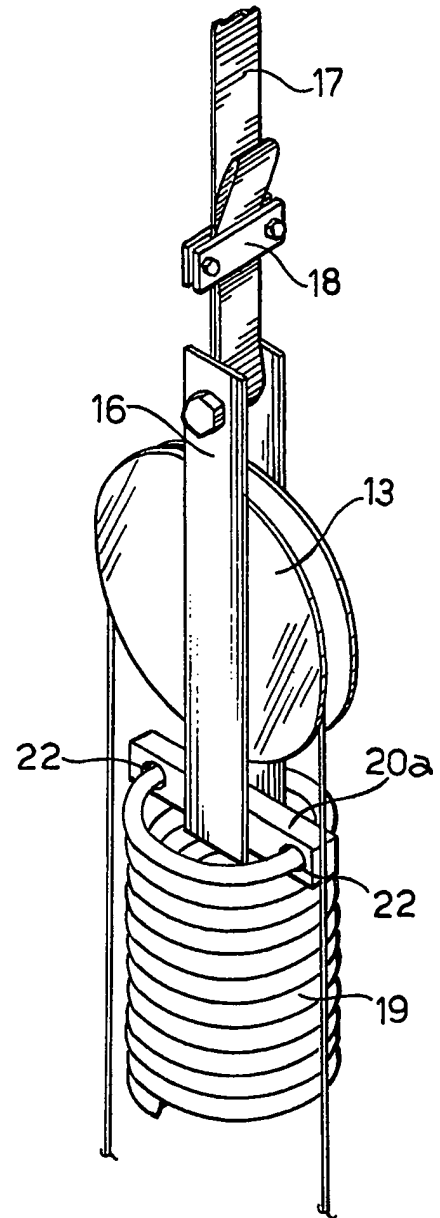


FIG. 7

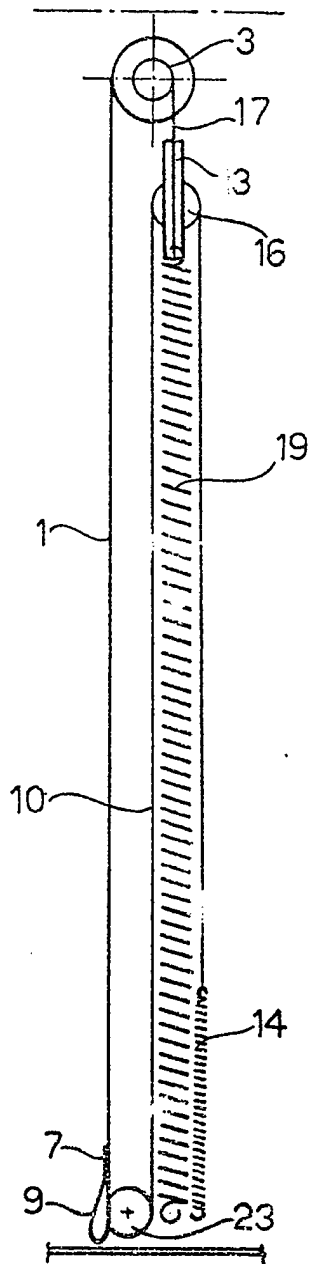


FIG. 8

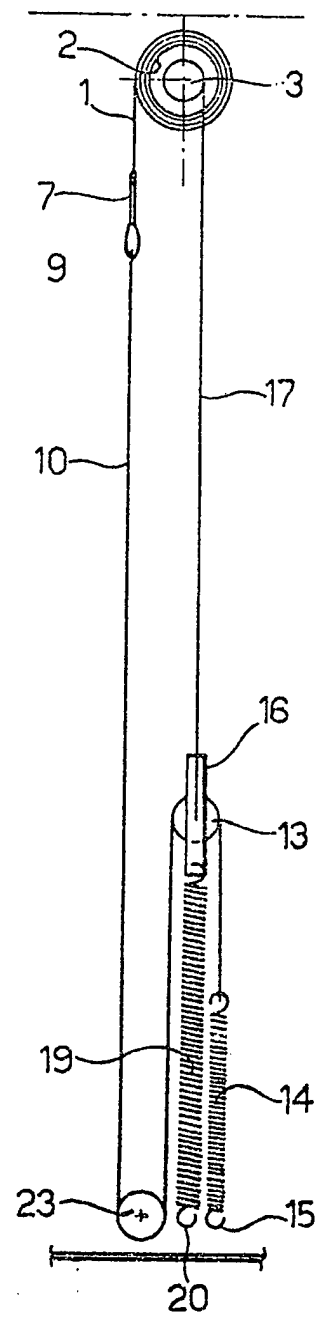




FIG. 9

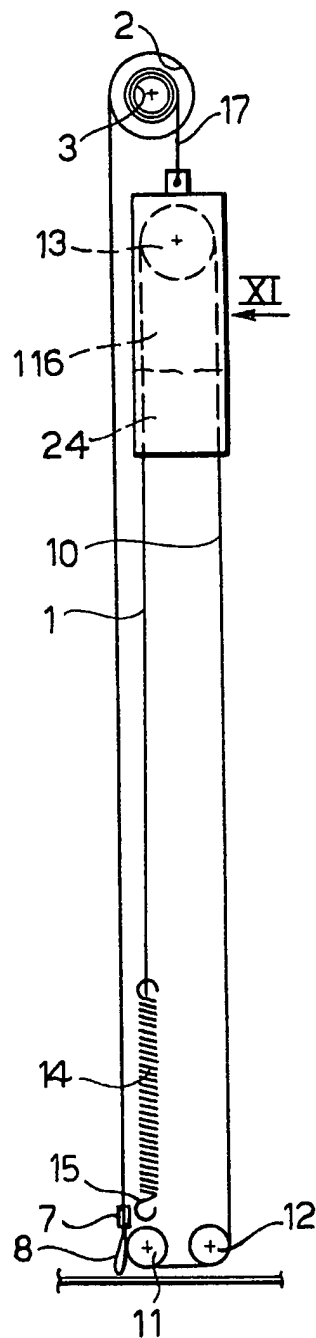


FIG. 10

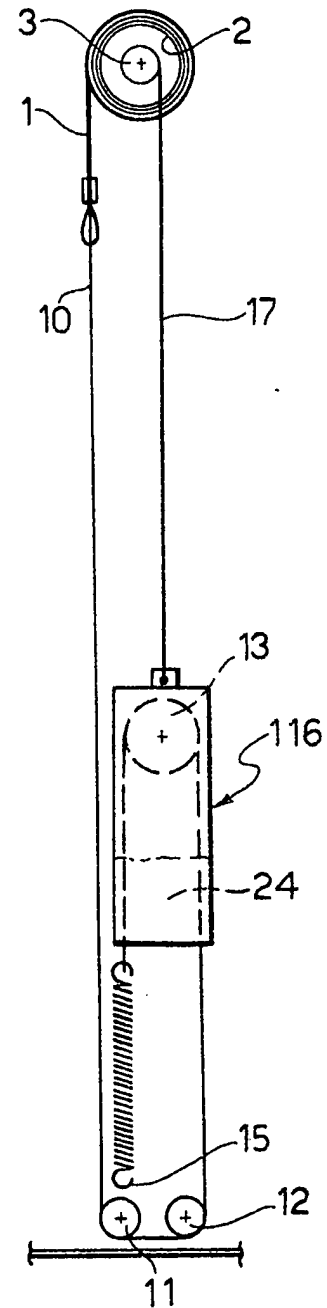
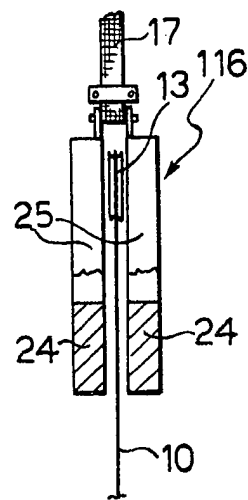


FIG. 11





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number

EP 88 83 0253

| DOCUMENTS CONSIDERED TO BE RELEVANT  |   |  |  |
|--|---|--|--|
| Category   | Citation of document with indication, where appropriate, of relevant passages         | Relevant to claim                              | CLASSIFICATION OF THE APPLICATION (Int. Cl.4)                          |
| Y,D  | EP-A-0 125 217 (NORDISKAFILT AB)<br>* Page 5, lines 5-37; pages 6-9;<br>figures 1-7 * | 1,2  | E 06 B 9/20  |
| A  | ---   | 3,4,6,7<br>,9                                  |  |
| Y  | DE-A-3 245 009 (SEUSTER)<br>* Pages 16-24; figures 1-4 *                              | 1,2  |  |
| A  | ---   | 3,4,6,7<br>,8,9                                |  |
| A  | US-A-2 543 711 (SCHULZ)<br>* Columns 3,4; column 5, lines 1-56;<br>figures 1-9 *      | 1,2,4,5  |  |
| A  | AT-B- 341 177 (LINDPOINTNER)<br>---   |  |  |
| A  | FR-A-2 181 601 (LES RESSORTS FRANCAIS)<br>-----                                       |  |  |
| The present search report has been drawn up for all claims   |   |  | TECHNICAL FIELDS<br>SEARCHED (Int. Cl.4)<br><br>E 06 B 9/204<br>E 06 B |
| Place of search<br>THE HAGUE   |   | Date of completion of the search<br>08-09-1988 | Examiner<br>VIJVERMAN W.C.   |
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